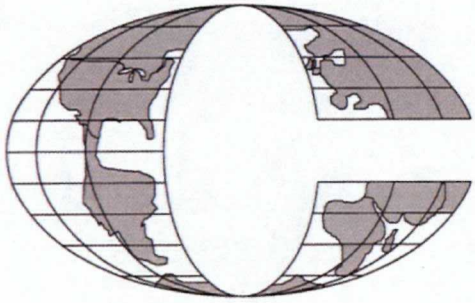
Prepared for

Pedricktown Site Group

SUPPLEMENTAL SEDIMENT SAMPLING WORKPLAN

NL Industries Superfund Site
Pedricktown, New Jersey

November 2007



Prepared by

CSI Environmental, LLC

918 Chesapeake Avenue
Annapolis, Maryland 21403

TABLE OF CONTENTS

TABLE

FIGURES

1. INTRODUCTION

1.1 Overview

This Supplemental Sediment Sampling Plan (Plan) was prepared by CSI Environmental, LLC (CSI) for the Pedricktown Site Group (Group). The Plan describes the procedures to be used to obtain sediment samples from the West Stream and adjacent floodplain at the NL Industries, Inc. (NL Industries) Superfund Site (site) located in Pedricktown, New Jersey (see Figure 1) as requested in the U.S. Environmental Protection Agency's (USEPA) October 16, 2007 letter. The Plan and the procedures to be used to implement the Plan conform to the USEPA *Region II CERCLA Quality Assurance Manual* [USEPA, 1989], and the Quality Assurance Project Plan (QAPP) which was prepared, under separate cover, in conformance with the *Uniform Federal Policy for Quality Assurance Project Plans* [USEPA, 2005].

1.2 Project Background

The site formerly contained a secondary lead smelting and recycling facility, located on 44 acres of land to the north of the Pennsgrove-Pedricktown Road, in Pedricktown, New Jersey (Figure 2). The site is bisected by an active railroad. Approximately 16 acres are located north of the railroad, including a closed 5.6-acre landfill, which is maintained by NL Industries. The southern 28 acres of the site contained the former industrial area. The West and East Streams, parts of which are intermittent tributaries of the Delaware River, border the site [USEPA, 1994] to the west and east, respectively. The West and East Streams flow into the Army Corps of Engineers' drainage channel and subsequently into the Delaware River.

The Group performed the remedial action (RA) for soil and sediment described in the Remedial Design (RD) [GeoSyntec, 1999]. The completion of the RA is documented in detail in the *Final Operable Unit One Remedial Action Report for Soil and Sediment* [Entact, 2003], which was provided to and accepted by the USEPA. The Group completed the sediment portion of remedial activities in 2002 and the entire RA for soil and sediment in 2003. At USEPA's request, the Group has performed post-remediation biological monitoring activities at and in the vicinity of the site since 2002.

The Group achieved the Remedial Action Objective (RAO) for the site specified in the ROD. The RAO was the removal of soil and sediment that contained concentrations

of total lead exceeding 500 parts per million (ppm). To implement the remedy, lead-contaminated media having total lead concentrations greater than 500 ppm were excavated and disposed off-site at facilities approved by USEPA. Furthermore, as provided in the ROD, lead-impacted soil and sediment that contained a leachable lead concentration greater than 5 ppm, as determined by the Toxicity Characteristic Leaching Procedure (TCLP), were stabilized prior to off-site disposal. Other materials, including concrete and demolition debris, were also disposed off-site.

1.3 Post-RA Stream Sediment Evaluation

The USEPA requested that the Group prepare a *Biological Monitoring Plan* [CDR, 2000]. The Group performed a pre-RA biological monitoring event at the site in 2000. Following the RA for soil and sediment, the Group performed post-remedial biological monitoring events in 2002, 2003, and 2004. The data (lead concentrations) from analysis of sediment sampling performed during the biological monitoring events are summarized on Table 1.

Review of post-RA biological monitoring data revealed that results were variable, but that six of more than 36 sediment samples contained lead concentrations greater than 500 ppm. The six samples that contained lead concentrations above 500 ppm were obtained from four of the locations monitored, which are identified as biological monitoring stations 1, 2, 4 and 5. Sediment samples from monitoring stations 1 and 5 contained lead concentrations above 500 ppm in 2002. Sediment samples from monitoring stations 2 and 4 containing lead-in-sediment concentrations above 500 ppm in 2003, and monitoring stations 1 and 2 contained lead concentrations above 500 ppm in 2004.

In a 13 September 2005 letter to the Group, the USEPA requested that a sediment sampling plan be prepared to describe procedures to be used to further evaluate the sediment quality at the site. The USEPA requested that the Group obtain and analyze samples of sediment from the West Stream, the US Army Corps of Engineers Channel and Oldmans Creek. The USEPA requested that the Group include sampling locations that were used for biological monitoring. The USEPA also requested that laboratory analysis of target analyte list (TAL) metals be included as part of the Plan.

The Group performed two rounds of sediment evaluations since 2005 using varying methods to obtain samples. The results were reported to the EPA on 19 January

2006 and 30 August 2006, respectively. The conclusions obtained from the evaluations were that the method used to obtain samples affected apparent results. When 6-inch cores of sediment are obtained, homogenized and analyzed, lead concentrations were well below the EPA-specified remedial action objective (RAO) for lead of 500 milligrams per kilogram (mg/kg). This finding is consistent with data obtained during the remedial action and previously reported to EPA. However, when a sampling dredge was used to obtain a two-inch deep sediment sample, lead concentrations sometimes appeared to exceed the RAO. Samples of sediment obtained below the two-inch depth contained lead concentrations well below 500 mg/kg. The maximum concentration of lead was detected within inches of the sediment surface.

Subsequent to submittal of the above referenced sediment evaluations, the EPA requested, in a 16 October 2007 letter, that the Group perform additional sediment evaluation to "further characterize the distribution of lead in sediments both in the West Stream from Pedricktown Pike (Pennsgrove-Pedricktown Road) to Route 130 and in the flood plain adjacent to the stream on both sides." In response to this request, the Group authorized CSI to produce this Supplemental Sediment Sampling Plan.

1.4 Interpretation of Results

During the completion of remedial activities at the site and as noted above, the Group's contractor collected sediment samples for characterization purposes from the base of the West Stream channel. The sediment samples were collected from a depth of 0 to 6 inches below the surface at a frequency of one sample per 100 linear feet of stream channel to verify the presence of sediment with total lead concentrations that exceeded the RAO. Based on the results of the characterization sampling, 19 areas were identified as requiring excavation. The impacted areas were then excavated using a hydraulic excavator to a distance of 50 feet on both sides of the characterization sample location and to an average depth of 6 inches. Upon completion of sediment excavation in the impacted areas, verification samples (0 to 6 inches deep) were collected from the original sample location to confirm that the RAO was achieved.

During the post-remediation sediment sampling activities described above, the Group's consultants collected sediment samples from various locations in the West Stream; some of those samples were collected from areas that were not defined for remediation using the remedial action sampling protocol and some of the samples were collected from remediated areas. In addition, some of the post-remediation sediment

samples were collected from a depth of 0 to 2 inches (in contrast to the 0- to 6-inch sampling depth utilized during the remedial action process). It was not until very shallow (0- to 2-inch depth) samples of sediment were evaluated that the remaining lead was detected. To address the post-remediation lead concentrations noted during the biological monitoring activities and confirmed during subsequent sampling by CSI, EPA has requested further study to delineate the impacted sediments that remain in the West Stream.

2. DATA QUALITY

Data quality will conform to the Data Quality Objectives (DQOs) presented in the RD. DQOs are qualitative and quantitative statements which specify the quality of data required to evaluate sediment concentrations in the West Stream and surrounding floodplain. The concentration of interest for lead in the sediment is 500 ppm, which is the RAO specified in the ROD. Therefore, the DQOs presented in the QAPP portion of the RD will remain applicable. Laboratory data will be validated using the procedures specified in the RD. DQOs will also be further addressed in a QAPP [CSI, 2007] to be submitted under separate cover.

3. EQUIPMENT DECONTAMINATION

3.1 Overview

Whenever possible, sampling equipment that will be used to sample sediment will be disposable so that the potential for cross-contamination between sampling locations is minimal. The procedures for decontaminating non-disposable equipment are provided below.

3.2 Sampling Equipment Decontamination

Non-disposable sampling equipment will be decontaminated according to the general procedures outlined below.

(1) Wash and scrub with low-phosphate detergent;

(2) distilled/deionized water rinse*;

(3) air dry; and

(4) wrap in aluminum foil, if not being used immediately.

* Tap water (for soap solutions) may be used from any treated municipal source. Commercially available distilled/deionized water may be used in lieu of tap water and will be used for final rinsing.

Field personnel will wear surgical-type gloves and appropriate clothing.

4. SAMPLE COLLECTION

4.1 Overview

This section describes the procedures to be used to obtain samples of sediment. The procedures to be used will conform to procedures used during the RD, with the exception of the analytical method. The sediment samples will be analyzed for total lead using the most recent USEPA protocol (USEPA Method CLP SOW ILM05.3). In the event that a sample cannot be obtained as planned, an alternate sample may be obtained. If samples are obtained from alternate locations, then the alternate locations will be marked in the field and documented in the field log book.

4.2 Sediment Sampling

To evaluate sediment quality, sediment samples will be obtained from the West Stream at the locations shown on Figure 3. Many of these locations were previously sampled in 2005 as indicated on Figure 3. However, additional sampling locations have been added in the northern portion of the West Stream channel and along the banks of the entire West Stream to address the EPA's 16 October 2007 request for additional sampling. The samples will be analyzed by a New Jersey certified laboratory for total lead.

Grab samples of sediment will be obtained from each sampling location as shown in Figure 3. In the West Stream channel, sampling locations are provided every 50 linear feet in the reach of the stream between Pennsgrove/Pedricktown Road and Route 130. Samples will be obtained from as near to the center of the stream channel as possible and biased towards typical depositional areas. In addition, grab samples of soil/sediment will be obtained at 200-foot intervals north of the Conrail railroad tracks and at 100 foot intervals south of the Conrail railroad tracks from both banks of the West Stream at the locations shown on Figure 3. Additional sample locations are also included at the confluence of the West Stream and the unknown tributary located north of the Conrail railroad tracks. Sample locations will be flagged in the field and coordinates recorded using Global Positioning System hand held devices.

Samples will be obtained in accordance with USEPA and NJDEP protocol for collecting sediment samples. Samples will be obtained from a depth of 0- to 6-inches below ground surface (bgs) by using a clean stainless steel push probe with a sediment

core attachment, unless the presence and depth of surface water prevents obtaining the sample using these methods. In deeply submerged sampling locations, sediment samples may be obtained using a petite ponar or Ekman style dredge, or similar device as needed.

The samples obtained from within the channel of the West Stream will be removed from the sediment core sampler and cut into two aliquots. The first sample collected will be from 0 to 2-inches bgs and then from 2 to 6 inches bgs. Therefore, each of the West Stream channel locations will have two samples collected from them, a 0 to 2-inch sample and a 2 to 6-inch sample. The 2 to 6-inch sample aliquots will only be analyzed if a detection of lead above the RAO of 500 ppm is reported for the 0 to 2-inch aliquot from the same location. The samples obtained along the banks of the West Stream will be analyzed using 0 to 6-inch bgs aliquots homogenized as described below. This sampling methodology is consistent with that used during the RA.

→ Should we sample same as above?

All samples collected will be homogenized to ensure that the samples are as representative as possible. Rocks, twigs, leaves, and other debris will be removed. The sediment sample will then be placed in a stainless steel pan with stainless steel utensils. The sediment will be scraped from the sides, corners, and bottom of the pan, rolled to the middle of the pan, and mixed. The sample will be split into four parts which will be moved to the four corners of the pan. Aliquots from each quadrant of the mixing pan will be combined and further mixed then placed in a contaminant-free, glass sampling jar, and will be labeled for shipment to the laboratory. After the samples are placed in sample containers, they will be stored on ice to maintain 4°C, and delivered under an executed chain-of-custody to the laboratory.

4.3 Project Team

The project team will include members who have participated in the RD and RA. Mr. Jeffrey Leed will remain the Project Coordinator. CSI will perform the field and reporting aspects of the project. Chemtech Laboratories, which has been previously approved by USEPA for work at the site, will perform the required laboratory analyses.

5 DOCUMENTATION

5.1 Overview

General field documentation, quality assurance/quality control, and reporting procedures and guidelines to be used in performing the project are addressed below. The procedures will conform with those used during the RD. If deviations from these procedures are necessary, alternative procedures, and the reason for their use, will be documented in the appropriate field activity log for that task.

5.2 Field Activity Logs

5.2.1 Introduction

A field log book will be maintained to record the details of field sampling and monitoring activities. This log book will be bound and will have sequentially numbered pages. Entries will be written in indelible ink and will be initialed and dated by the field personnel recording the information. Corrections to log entries will be made by crossing out incorrect entries and initialing and dating the strike-out. The correct entry will then be made. In addition, field sampling logs for each sample location will be maintained.

5.2.2 Field Sampling Logs

In addition to the descriptions of field investigative activities and field data recorded in the field log book, details of sampling information may be provided on field sampling logs. Field sampling logs will generally include the following information:

- date and weather;
- personnel;
- time and description of investigative activities;
- sample medium will be sediment only and type (i.e., grab, composite, duplicate, etc.);
- sample collection technique(s);
- sample containers will be 100 g glass jars with no preservatives;
- sample number, location, and depth;
- sampling times;

- pertinent field observations; and
- name of samplers.

5.3 Sample Nomenclature

Samples that are collected in the field will be identified with a unique alpha-numeric designation. Each designation will be specific to the sample matrix. For example, a supplemental sediment sample will be assigned the character identifier SD-xxyy(zz), where:

SD	=	the designation for sediment sample;
xxyy	=	the location identifier or sample location identifier; and
zz	=	the depth at which the sample was collected (in inches);

False designations will be used to designate blind duplicate samples.

5.4 Quality Assurance/Quality Control

The control program for the supplemental sediment sampling activities will include the collection and analysis of quality control (QC) and quality assurance (QA) samples. QC samples are those collected by CSI and submitted to the laboratory along with the environmental samples. QC samples will include equipment rinsate blanks, trip blanks, matrix spike, matrix spike duplicate samples, and duplicate samples. QA samples are those samples collected by USEPA and submitted to USEPA's laboratory. QA samples will include split samples of equipment rinsate blanks and duplicate split samples and will be provided to USEPA, if requested. QA/QC procedures will be further addressed in a separate QAPP to be published under separate cover.

5.4.1 QC Equipment Rinsate Blanks

Equipment rinsate blanks are rinsates of sampling equipment collected at the site. Equipment rinsate blanks will be made for each type of equipment used each day that a decontamination event is performed, not to exceed one per day. They will be prepared in a similar manner to field blanks, except that the deionized/distilled water will be passed through the field sampling device prior to collection in the rinsate blank bottles. Equipment rinsate blanks will be collected from bowls and pans used to homogenize sediment samples, as well as from other sampling equipment.

5.4.2 QC Duplicate Samples

Duplicate samples are defined as two distinct samples taken from the same location at the same time using the same sampling equipment. Duplicate samples will be analyzed for the same parameter (total lead) as the original samples. Duplicate samples will be collected for each matrix at a minimum rate of one for every 20 samples (5% of total) and are to be submitted to the laboratory as "blind" samples. If less than 20 samples are collected during a particular sampling event, one duplicate will be collected. Duplicate sediment samples will be homogenized in the field, subdivided, and submitted to one laboratory for analyses as two distinct samples.

5.4.3 Matrix Spike/Matrix Spike Duplicate Samples

The laboratory will be supplied with triple sample volume for matrix spike (MS) and matrix spike duplicate (MSD) sample analyses. Samples will be submitted to the laboratory for MS/MSD analyses at the rate of one per every 20 field samples collected.

5.4.4 QA Duplicate Splits and Equipment Rinsate Split Samples

Samples will be split with the USEPA for analysis by the USEPA, if requested. Split samples are defined as one distinct sample that is divided equally and sent to two different laboratories for analysis. USEPA's designated laboratory will provide sample containers and preservatives for QA samples. Duplicate split samples will be collected for each matrix, as required by the USEPA. Sediment samples will be homogenized in the field and will then be subdivided and submitted to the respective laboratories as two distinct samples.

The QA duplicate split and equipment rinsate split samples will be shipped to USEPA's designated laboratory and will be analyzed for the same parameters as the original samples. The samples will be containerized, preserved, and handled in the same manner as the original samples.

5.5 Reporting

The Group will provide a written report of its findings to USEPA. The report will include data tables, laboratory reports, and diagrams showing sampling locations, and

recommendations for additional sediment sampling if determined to be necessary. Metal concentrations will be reported on a dry weight basis. The Group will address USEPA's comments on the report, if any, as appropriate.

6. SCHEDULE

The Group will implement the Plan with USEPA concurrence. The Group anticipates that sampling activities will begin within 30 days of USEPA approval of the Plan (estimated start, weather permitting, of 1 February 2008). Sampling will be completed within 30 days of the date sampling is initiated (29 February 2008). Data will be received and validated within 45 days of completion of field work (15 April 2008). CSI will then begin work on the Supplemental Sediment Evaluation Report. The Group anticipates providing a written report to USEPA documenting the results of the sediment sampling activities within 30 days of completion of data validation (15 May 2008).

If the data from the sediment sampling indicate that additional sampling is necessary to further define the extent of lead-in-sediment concentrations above 500 ppm, the Group and CSI will discuss with EPA the data and plans for additional sampling. The Group will discuss its plans and schedule for contractor procurement, submission of a Removal Action Work Plan, and related activities at the time that CSI Environmental's Supplemental Sediment Evaluation Report is submitted to the USEPA.

7. SAMPLE CONTAINERS, PRESERVATIVES, AND HOLDING TIMES

Sample containers, preservatives, and holding times will conform with those specified in the QAPP. All sample containers for samples submitted for laboratory analyses will be provided by the contract laboratory. Containers will be new and contaminant-free. Sample preservation is not required for sediment samples. All samples will be cooled to 4°C (40°F) after they are collected.

Generally, sediment samples for the analysis of total lead can be stored for up to 6 months prior to analysis.

8. SAMPLE PACKING, SHIPPING AND DOCUMENTATION

8.1 Sample Packing

Procedures for sample packaging, shipping, and documentation will conform to procedures used during the RD. The samples obtained during the supplemental sediment sampling will be placed in shipping coolers with sufficient packing material to prevent breakage during shipping. Each shipping cooler will also be packed with sufficient ice to maintain a temperature of 4°C (40°F) during shipment. Cooler temperature will be verified immediately upon arrival at the laboratory, prior to inventory and refrigeration. All samples in a shipping container will be listed on the chain-of-custody enclosed in the shipping container. Once the samples are securely packaged, the container will be sealed with tape and several custody seals will be placed over the top edge of the shipping container.

8.2 Shipping

Within 72 hours of collection, the samples will be shipped to the laboratory via courier service (Federal Express, Airborne, etc.), or will be picked up in the field by the laboratory, and will include a separate, signed chain-of-custody enclosed in the container. A shipping document for the courier service will be completed for each shipment.

8.3 Documentation

Documents recording sampling events will include field sampling logs, sample labels, field logbook and chain-of-custody seals and forms.

8.3.1 Sample Labels

Each sample bottle will be labeled with the following information: date and time of sample collection, sample number, analyte(s), project name, and sampler's initials. Indelible ink will be used to record information on the sample label.

8.3.2 Custody Seals

Custody seals will be used when a sample shipment is picked up by the laboratory or sent to the laboratory by overnight courier. Signed and dated custody seals will be attached to the top of the shipping container in such a way that it is necessary to break the seal to open the container. Custody seals ensure that any tampering during transportation will be detected by the receiving laboratory.

8.3.3 Chain-of-Custody Forms

Chain-of-custody forms provide the documentation to trace sample possession from the time of sample collection until sample analysis by the laboratory. One chain-of-custody form will be filled out for each cooler or shipping container and will list all of the samples contained in the cooler or container. One copy of the completed form will be placed in a plastic bag taped to the inside lid of the shipping container and one copy will be kept with the project files.

9. REFERENCES

CDR Environmental Specialists, Inc., *Biological Monitoring Plan, NL Industries, Inc. Superfund Site, Pedricktown, New Jersey*, May 2000.

Entact, Inc., *Final Operable Unit One Remedial Action Report for Soil and Sediment, NL Industries Inc. Superfund Site, Pedricktown, New Jersey,* July 2003.

GeoSyntec Consultants, *Final Design Report, Remedial Design for Soil and Sediment, NL Industries, Inc. Superfund Site, Pedricktown, New Jersey*, November 1999. (Includes Sampling, Analysis and Management Plan (SAMP), Quality Assurance Project Plan (QAPP) and Health and Safety/Contingency Plan (HASP) as appendices)

United States Environmental Protection Agency, *Region II CERCLA Quality Assurance Manual,* October 1989.

United States Environmental Protection Agency, *Record of Decision, Decision Summary, NL Industries, Inc., Pedricktown, Salem County, New Jersey,* July 1994.

United States Environmental Protection Agency, *Uniform Federal Policy for Quality Assurance Project Plans*, EPA-505-B-04-900A, March 2005.

TABLES

Table 1
Lead-in-Sediment Results from Biological Monitoring Activities
NL Industries, Inc. Superfund Site
Pedricktown, New Jersey

Sampling Station	2000 Pre-Remedial Lead (mg/kg)		2002 Post-Remedial Lead (mg/kg)		2003 Post-Remedial Lead (mg/kg)		2004 Post-Remedial Lead (mg/kg)	
	Wet Weight	Dry Weight	Wet Weight	Dry Weight	Wet Weight	Dry Weight	Wet Weight	Dry Weight
1	240	300	550	600	220	270	310	1,400
2	110	690	20	100	83	590	130	860
3	150	1,100	31	110	38	85	31	180
4	170	250	190	320	370	840	95	190
5	110	240	260	630	68	360	20	73
6	120	310	88	250	56	130	19	31
7	86	170	54	180	42	69	40	98
8	94	330	78	200	17	22	15	20
9	83	280	31	90	38	90	32	81
10	46	120	21	49	27	50	19	27
11 Reference	5.0	7.2	6.1	13	4.5	8.5	8.6	24
12 Reference	33	87	34	70	32	82	25	62

Note: Table extracted from *CDR Environmental Specialists, Inc., Biological Monitoring Report for NL Industries Superfund Site in Pedricktown, New Jersey,* 2004.

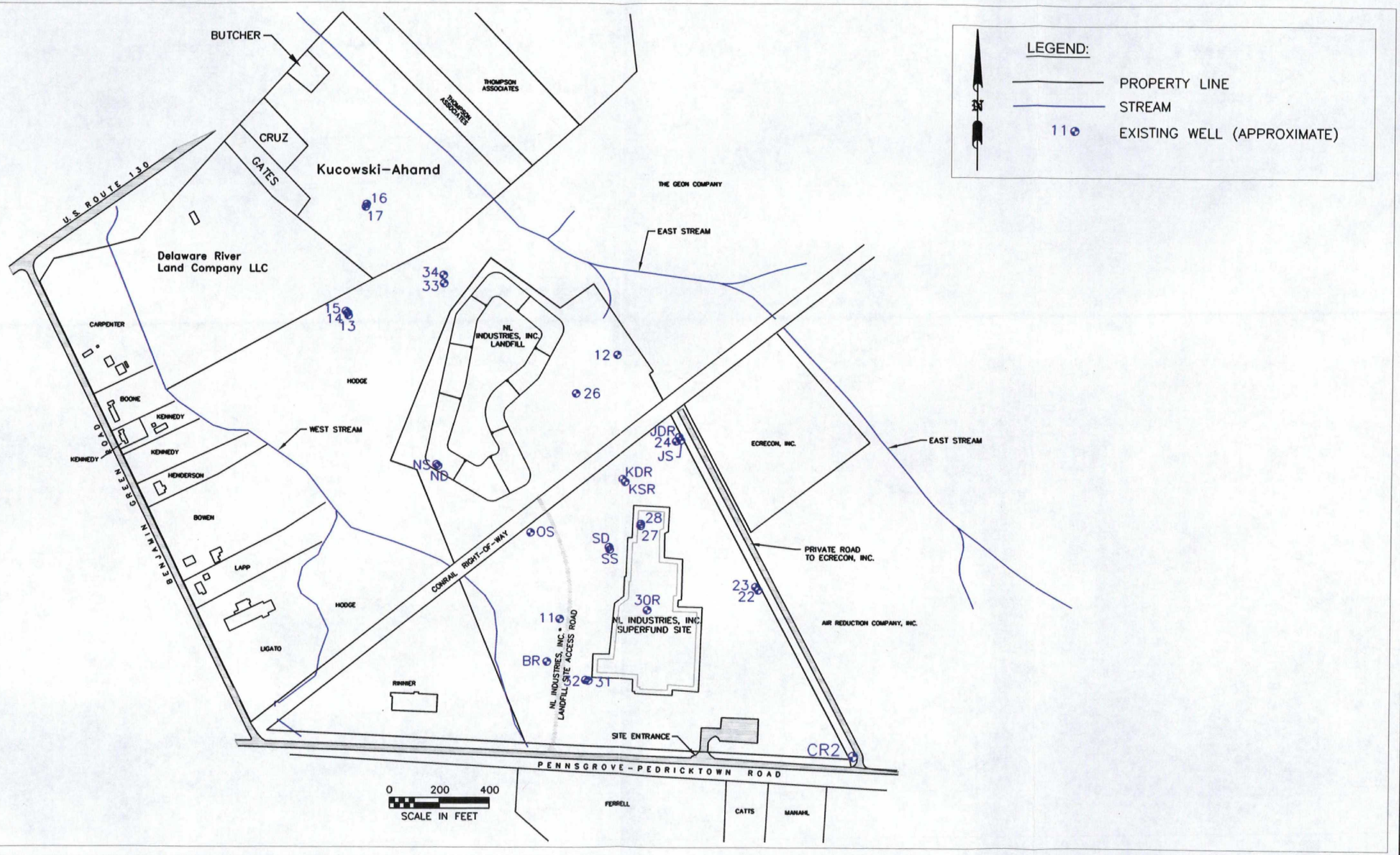
FIGURES

CSI Environmental, LLC
918 Chesapeake Ave.
Annapolis, MD 21403
410-268-2765

Site Location

NL Industries Superfund Site
Pedricktown, NJ

FIGURE
1



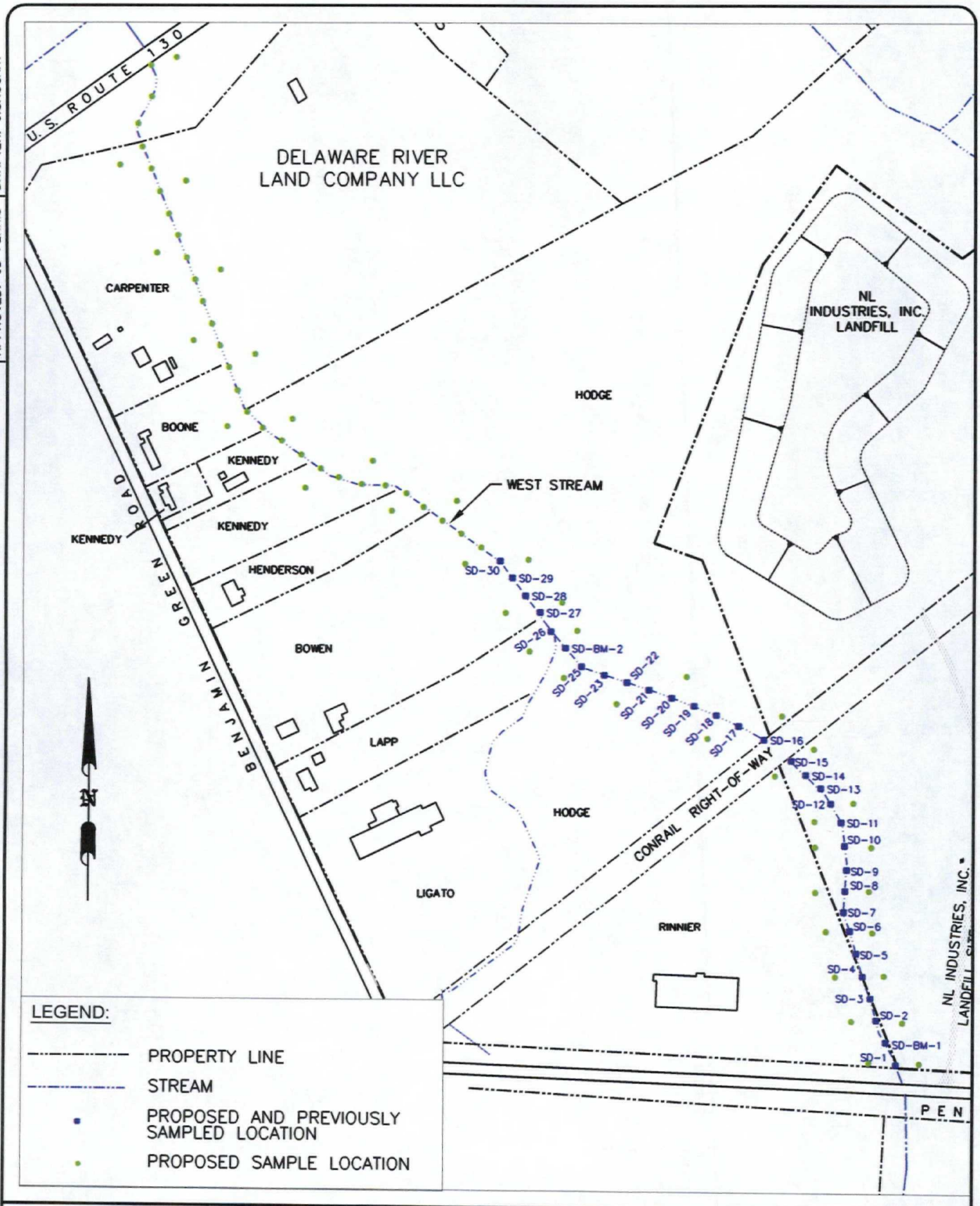
CSI Environmental, LLC
918 Chesapeake Ave.
Annapolis, MD 21403
410–268–2765

Site Overview

NL Industries Superfund Site
Pedricktown, NJ

FIGURE
2

APPROVED: JD FERRIS | DRAFTER: J.SHUGART



CSI Environmental, LLC
918 Chesapeake Ave.
Annapolis, MD 21403
410-268-2765

Proposed and Previously Sampled Sediment Locations

NL Industries Superfund Site
Pedrickstown, New Jersey

FIGURE
3